SUPPLEMENT.

The Mining Journal,

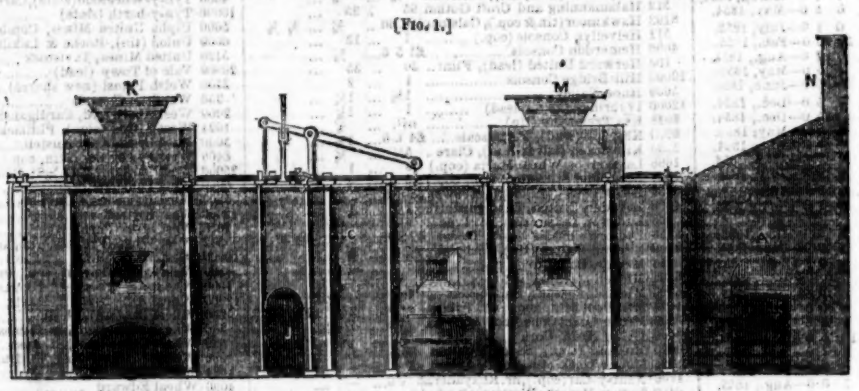
RAILWAY AND COMMERCIAL GAZETTE:

FORMING A COMPLETE RECORD OF THE PROCEEDINGS OF ALL PUBLIC COMPANIES.

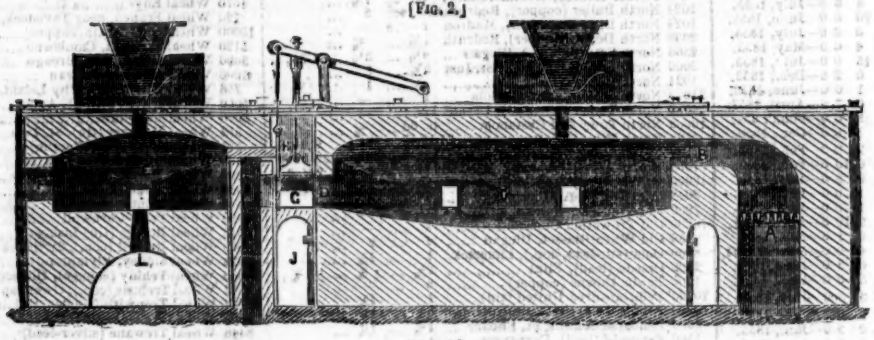
No. 1042—Vol. XXV.] LONDON, SATURDAY, AUGUST 11, 1855. [GRATIS.

DOUBLE REVERBERATORY FURNACES, FOR CALCINING AND REDUCING LEAD AND COPPER ORES.

[Fig. 1.]



[Fig. 2.]



[Fig. 3.]

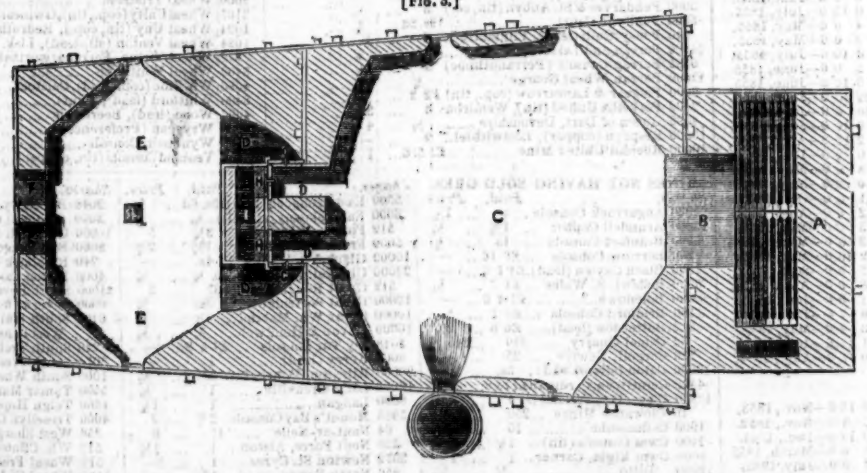


Fig. 1 of the annexed illustrations represents a side elevation of the improved Double Reverberatory Furnace. Fig. 2 is a corresponding longitudinal vertical section of the same, and fig. 3 is a corresponding plan thereof. A is the ordinary fire-place, the heat and flame from which pass through the lateral opening or flue, B, into the flowing furnace, C, and after traversing over the surface of the ore contained therein, enter by the passages, D D, into the calcining furnace, E, which is on the same level with the floor of the flowing furnace, F F are passages leading off to the main draught flue, or chimney. When it is required to shut off the heat and flame from the calcining furnace, the two dampers, G G, are closed, and the pair of dampers, H H, are elevated, thereby shutting off the flow from the passages, D D, and diverting it into the descending or waste flue, I, which conducts it underground to the main flue. An air or ventilating space, J, is left between the calcining and flowing furnace, in order to prevent the bed of the latter furnace from becoming over-heated. The ore to be calcined is fed into the calcining furnace by the hopper, K, and is removed when calcined through the aperture, L, in the bottom of the furnace. A similar hopper, M, supplies the calcined ore to the flowing or reducing furnace. The small chimney, N, serves to carry off any dust or ashes arising from the fire when fresh fuel is supplied, or when it is otherwise agitated.

Various advantages are derived from the use of the improved Double Reverberatory Furnace, as follows:—In the first place, the waste heat, after passing off from the flowing furnace, is economised and employed for effecting the calcination of the ore, instead of additional fuel being required for that purpose, whilst a slight portion of oxygen accompanies the waste heat from the flowing furnace in a condition to act on the ore in the calcining furnace, rendering it more easily worked, notwithstanding that it may be otherwise extremely refractory.

Secondly, as two charges of ore, weighing from 48 to 50 cwts., can be worked at the same time, and with one ordinary fire, an immense saving in fuel must necessarily be effected.

Thirdly, whereas much mischief frequently arises in the ordinary reverberatory furnace during the early part of the calcining process, but more particularly with refractory ore highly charged with sulphur and a variety of metals, such as zinc or antimony; and if not practically understood by the workmen in charge, the furnace becomes quickly over-heated, and, in consequence, a partial fusion takes place of the sulphuret of lead, and some other ores when subjected to calcination.

This mischief being done, is seldom repaired without a great loss both of labour and of metal. As a proof of frequent bad workmanship, or a want of knowledge in treating the ore, we need only refer the master smelter to the large quantities of quicklime used, than which nothing can be more injurious when used to excess, as is too often the case. It absorbs an immense quantity of protoxide of lead, nor can this be reduced in the slag-hearth, or otherwise, without a great loss.

This mischief cannot well occur in the improved Double Reverberatory Furnace, even with smelters of little experience; and the average loss of lead will be found not to exceed 5 per cent. on all ordinary ore.

The inventor and patentee has pleasure in informing the trade generally, that he is now putting up his first furnace on the new system in England, at the C. B. Mines in Arkindale, near Richmond, Yorkshire, where they have hitherto employed daily six ore hearths, this well-known mining and smelting company feeling convinced that it is high time to do away with the present extravagant mode of smelting.—A. Jenkin: *Eyam, Derbyshire.*

The monthly meeting of the Association for the Prevention of Steam-Boiler Explosions, and for effecting Economy in the Raising and Use of Steam, held their monthly meeting on Tuesday, July 24, at the chambers of the secretary, Mr. Henry Whitworth, Corporation-street, Manchester, at which the chief inspector of the association submitted his report for the last month, an extract from which we have been furnished with. It appears that since the 25th of June last there have been made, under the auspices of the association, 203 inspections, comprising 696 boilers. The report then goes on to state that of these "we found eight boilers in a dangerous state. In seven of these the furnaces had been injured from deficiency of water, and in the other from deposit of scale on the plates. In five other cases the safety-valves were out of order, and would not act, and in many other instances they were considerably overweighted. Some of the boilers not adapted to so high a pressure as they were working at have already been strengthened as recommended, and others are undergoing similar alterations." There have been no cases of explosion or collapse in boilers of any of the members.

Iron Manufacture.—Mr. Robert McCall, of Pallas-Kenry, Limerick, has patented an improvement in the manufacture of iron and steel. The inventor employs, in connection with certain closed furnaces, air chambers in combination with either hot or cold blast, for the purpose of creating the necessary draught in the furnace, instead of employing a mechanical blast only when such furnaces are used for "roasting" or "torrefying" the ores of iron; and when the furnace is required to be used for the smelting of ores of iron only, the chambers are closed by dampers.

A BATTLE WITH THE BASALTS;*

BEING AN ATTEMPT TO DELIVER THE CHIEF OR PRIMARY CRYSTALLINE MASSES FROM PLUTONIC DOMINION.

BY JOSEPH HOLDSWORTH, ESQ., M.G.S.F., ETC., ETC.

The varied and provident structure of the globe we inhabit is ever eminently calculated to win admiration, and arouse a spirit of enquiry even in the most supine and incurious. To meditative minds it furnishes a most fascinating and inexhaustible theme. It is rife in wholesome instruction, and almost every stony page of its vast and sublime volume teems with startling evidences of mighty cycles of changes, together comprising a period of duration wholly incognisable to finite beings. Its glittering legends bear, also, the impress of past, present, and future transmutations, as regards even the minutest and simplest substances of which they are composed, and which, though apparently inert and quiescent, may, for the most part, truly be said to be in a state of incessant actuation and change, accomplishing in the fulness of time, by inappreciable and insensible action, procreations and transformations of the most striking and inconceivable character, and this too, as has been well remarked, not in a fortuitous and confused manner, but in a regular subjection to harmonious principles, mechanical and chemical. And yet, notwithstanding the stores of knowledge already acquired of such complicated and recondite results, man has as yet failed to draw aside the impenetrable veil which shrouds in mystery the creation of the terraqueous globe,—nay, even after the most erudite and attentive contemplation of the nature, variety, and disposition of the materials composing its crust, the deepest insight into the character, extent, and grandeur of its multifarious phenomena, the acutest philosophic investigator has, in this respect, but felt himself compelled to retire from the scrutiny with deeper and more solemn impressions of the glorious, unsearchable attributes of its Creator, and a humiliated sense of his own limited powers to comprehend the creative processes of Him "whose ways are past finding out," and to whom alone our grateful aspirations are ever due "for the chief things of the ancient mountains, and for the precious things of the lasting hills, and for the precious things of the earth, and the fulness thereof."

It will not, however, in the present limited enquiries, be necessary to enter into any special speculations respecting the antiquity of the earth, or to advert to the numerous theories from time to time promulgated thereon, with the exception of the Wernerian and the Huttonian, which, though antagonist hypothesis, constitute the received basis of geological principles of the day. If, in the system of the former, which ascribes to the operation of water the formation of all rocks from the granite up to the most recent beds, certain extreme opinions have been exploded, it is, we imagine, no less desirable that the dogmas of the latter, attributing to igneous fusion the derivative formation of the granitic and trappean rocks, be subjected to every test which it is possible for experienced and diligent enquirers to bring to bear upon them; more especially as, despite the palpable evidence Nature so very commonly presents in opposition to these particular Plutonic views, many of our leading geologists have received them as sound and indisputable doctrine. It is solely from impressions derived in the course of a protracted series of investigations, that I at length venture to offer a few deferential observations in dissent to the authoritative axioms above referred to, and which, if they should fail to convince, may, at least, prove suggestive of enquiries calculated to cast a broad and penetrating light on this as yet mysterious, but extremely interesting, department of speculative geology.

It is then proposed, first, to advert to the trappean, or basaltic family of rocks, and next, cursorily to the crystalline masses generally, in illustration of, and in relation to, the extreme igneous propositions. With regard to the former, the practical geologist has not unfrequently expressed surprise at the occasional remarkable intermixtures of these supposed igneous deposits with sedimentary formations, and, as is particulary observable in some parts of the igneous tracts of North Britain; many such examples in distant regions have also fallen under my notice; but, perhaps, some of the most inexplicable of them occur in North Wales, where, near the Vale of Festiniog, small amorphous masses of greenstone may occasionally be seen completely enveloped in the slate formations; these alleged igneous products thus affording ocular demonstration of certain arbitrary isolated action of the crystalline forces, perhaps subsequently to the consolidation of the slate rocks, and which, in some few instances, are overlaid by vast irregular bodies of greenstone. But the present disquisitions have been more especially induced by the results of very frequent and minute examinations I have lately made of the phenomena presented by Salisbury crags, skirts of Arthur's Seat, and other trappean formations in the neighbourhood of Edinburgh—a field peculiarly Dr. Hutton's own, and a vantage ground pretty stoutly maintained by, I believe, all his talented votaries residing in that unique and beautiful city.

An allusion to the particular facts or appearances just adverted to, as characterising the former noble display of mural precipices, will be sufficient for our purpose, and it is obvious our critical description of them cannot be too accurately delineated. Salisbury crags may, for the most part, be correctly designated a hugh isolated wedge-shaped mass of greenstone, the thin edge of which terminates at what is called Hunter's Bog, and its broad end, of some 70 or 80 feet high, constitutes the perpendicular cliffs, around the basements of which, and on the ledge of a vast talus, sweeps the lofty and charming pathway from which our surveys of the following phenomena have chiefly been made.

In commencing our ascent up it, at the northern extremity of these trappean heights, we observe that they are here capped by a very striking array of horizontal sedimentary strata of marl and sandstone, the latter being of a deep ferruginous tinge, and a few yards further on we perceive long regular ranges of similar aqueous deposits, forming the base of the greenstone rocks; which, say the Plutonists, have here intruded themselves between these coal measures at a time when, in molten streams, they issued forth from boiling depths beneath, and, probably, at the spot now occupied by the truncated column of hard splintry traprock surmounted by the Castle of Edinburgh!

Such, then, is here the relative position of these igneous and aqueous formations, as viewed in their general aspect, let us now proceed to examine into the enigma of their more intimate and complex interminglings. With this view we have scarcely proceeded 80 yards in our northern ascent, before attention is particularly arrested by the singular mineralogical appearance of a high projecting bluff of greenstone, the central

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* TO THE EDITOR OF THE MINING JOURNAL.

Sir,—It was originally intended that the accompanying paper should appear as a *brochure*; but having observed that the subject of which it treats continues to be discussed in your Journal by several of your able correspondents, I have determined on submitting it to you for insertion in its columns, should you think well to devote thereto so much of your valuable space.

As its contents are chiefly the result of careful and oft-repeated actual investigations of the "igneous" rocks of North Britain, &c., and direct reference is made to the most familiar illustrations, it is trusted they may tend to throw some additional light on the question at issue, and which, I need hardly observe, is one of high interest, as involving important geological considerations.—J. Holdsworth.

portions of which, from top to bottom, are streaked with the red sandstone sediment, occasionally in distinctive veins, but for the most part intimately blended with the crystalline ingredients of the greenstone, as completely as though the materials of the respective (igneous and aqueous) rocks had been passed together through a gold quartz crushing machine.

As we continue to ascend, they are occasionally to be seen passing into each other by insensible gradations the sedimentary strata, having not only received increased induration, but their grain and colouring having permeated some distance into the superincumbent igneous mass at other points, the regular layers of the former are suddenly terminated, and succeeded by partially formed bodies of the latter. About half-way down the path, as it continues at the foot of the craigs facing the south, a singularly detached mass of the aqueous strata presents itself in the face of a huge projection of greenstone, and by which it is completely enveloped; but the most remarkable condition of this description is to be seen in the upper portions of the last of these cliffs, situated at the bottom of the southern descent. Here, several horizontal strata of sandstone of from 1 to 2 and 3 in. thick traverse, in their apparently original position and parallelism, the solid body of the igneous rock, and by their intimate contact with which they, for the most part, are not at all altered in composition or texture.

Now, I think it can hardly fail to be perceived that the few actual appearances I have now briefly, but faithfully, endeavoured to depict are wholly irreconcilable with the idea of vast fluid bodies of incandescent matter having thus regularly and delicately separated, rifted, upheaved, and often permeated and comminuted, as it were, the sedimentary strata, which originally occupied *en masse* the entire tract in question. The first and last examples cited (of the intimate blendings of the ingredients, &c., of the respective formations) especially appear decidedly to militate against such a conception; but an adequate appreciation can, of course, alone be formed by an actual observer narrowly inspecting all the complex minutiæ and self-evident transmutated details of the existing phenomena, and of which it will be requisite presently to enter into some further expositions.

I have said that eminent local geologists have adventured the supposition that this vast detached wedge of trap was originally joined to the dark, splintry column composing the Castle Hill—was a part of the stream of lava which flowed from that possible volcanic focus; but, even granting this, it is impossible to imagine that the ocean surges which have swept away such enormous accumulations of the adjacent sedimentary deposits could have made the slightest impression on the hard, compact body of trap rock said to have intervened between the respective localities; and if so, we may well ask what force can have effected its present entire disappearance? This consideration equally applies to many of the isolated caps and tabular masses of trap disseminated so very generally over certain regions of the globe, and which have long been classed amongst some of the most inexplicable operations of Nature. Then, again—as in one or two examples is partially exhibited in the Salisbury crags—there are numberless well-defined instances of trappean rocks being interstratified with sedimentary deposits, having been, say the plutonists, protruded between such regular strata *laterally*—as, for instance, the basaltic beds in Teesdale, those alternating with coal measures in the north of England, and the well-known phenomena of beds of amygdaloidal basalt between (uncalcined!) beds of mountain limestone in Derbyshire, Dr. Hutton and Professor Sedgwick having invited especial attention to the former, as inferred instances of the *lateral intrusion* of trap, from the altered appearances of the *superincumbent*, as well as the lower strata with which it lies in contact. I may here, however, observe that the igneous theorist gives great prominence to the circumstance of the altered or more indurated character often presented by the foreign strata lying in contact with his so-called igneous masses; but it should be recollected that a high degree of heat brought into such immediate contact with limestone would drive off the carbonic acid gas, and leave it a mere pulverulent calx of lime; whereas the increased induration, &c., observable has, in all probability, been induced by the close approximation of the intense chemical action, &c., as, in effect, is exhibited in the transmuted masses (igneous) in question. And we should also not be unmindful that large volumes of carbonic acid permeating cretaceous bodies of rock will convert it into marble—a fact which may account for the hard crystalline texture of chalk and tertiary strata not unfrequently met with in the Alps. In some particular instances it has been found that granite, porphyry, &c., have penetrated superincumbent sedimentary deposits without at all altering their texture or constituent characteristics; but these anomalous examples are met by the Plutonists averring that, in such cases, they have been protruded through them in a perfected state of crystallisation and induration! Assuredly this cannot be said of the basalts alternating with (unchanged) *horizontal* limestone strata. Again, the injected strata of igneous matter are found to be of all degrees of thickness, from a foot or two to many feet or yards thick; and in attestation of their lateral protrusion, Dr. MacCulloch adduces an instance on the coast of Scotland, where "trap may be seen forming beds between strata of sandstone, then suddenly cutting through the upper strata, and forming other beds above." Now, considering that these fiery injections are supposed to have been effected under enormous accumulations of stratified deposits, it appears absolutely beyond the range of possibility to conjecture that such often thin streams of incandescent matter would be invested with a lateral force sufficient to insinuate themselves actually through, as well as between, the hard consolidated mineral beds, moving, as it were, mountains of superimposed matter in their onward progress, and this, too, in regular alternate sequence amongst the sedimentary deposits; and, in each latter instance, probably for many miles in extent. In short, the more we attempt to reconcile these anomalistical displays of Nature (whether presented on a large or a minute scale) with ideas of an igneous origin, the more insuperable are the obstacles which arise to our consideration, amounting, in fact, in some cases, to *physical impossibilities*.

Under impressions such as these, derived, as above intimated, from extensive and attentive observations of the varied and complex phenomena presented by sober nature, I venture to offer—in strict accordance with acknowledged principles—a solution of the interesting problem we have more immediately under consideration. No one, I imagine, can examine into the structure of the earth, however superficially, without yielding to a conviction that innumerable transmutations have, in the process of time, and through the medium of over-active agents and re-agents, under the control of Nature's immutable laws, been effected in its various constituents, and physical elaboration. The common expression of "the living rock," is imbued with a truth and importance little imagined by the generality of those who make use of it. As, on the surface of the globe, almost all that we behold in nature may be said to be one universal scene of incessant motion and change, destruction and reproduction, harmoniously operating, as heretofore, through vast cycles of time, performing transformations and revolutions, of the true character of which we, as finite beings, can at best form but puerile and inadequate conceptions, so, in its great subterranean laboratory, numerous subtle elements are as incessantly engaged on the marvellously changeful and procreant missions for which they were originally destined by their inscrutable Creator. There, gaseous currents, charged, perhaps, with chemical ingredients, speed their mystic courses, or, in other words, electricity, implicated with chemical composition and re-composition, silently and gradually effects, by the simplest and minutest processes, modifications and transmutations of the most surprising extent and magnitude. Other agencies and forces, of which we have no cognisance, doubtless, are also there—indeed, as has been well remarked, "it would be the extreme of presumptious absurdity to maintain that the causes we observe in present operation comprise the whole agencies of the material universe. The discoveries of electric and voltaic energy, and several laws of crystalline and magnetic polarity, have only been made during the lifetime of some of the present generation: shall we, then, presume to fix limits to the discoveries of other powers and properties of Nature, of whose existence we cannot at present form the most remote conjectures?"

A due regard, then, to these facts and considerations will enable us to apply, with little or no difficulty, some of these incessant latent powers of Nature, in effectuating the singular variety, composition, and stages of transition observable in the lithological character of rocks attributed to igneous action. And, be it observed, the enunciation of such an hypothesis does not necessarily exclude all ideas of heat, which, whether derived from chemical, electrical, or certain local sources, has, in all probability, not uncommonly performed a somewhat important part in some of these and other remarkable mineral transformations, &c. The greenstone of Salisbury crags, and their neighbouring (trappean) congeners, it is hardly necessary to observe, after the above explications, may not improperly be classed with what geologists term the metamorphic rocks. But, in endeavouring to elucidate this position, it will be necessary to premise that the carboniferous strata, which environ the "igneous" elevations of the country in the neighbourhood of Edinburgh, are believed to have greatly overtopped these insulated heights at a period when, in molten streams, they are affirmed to have been erupted through them from volcanic depths beneath. Mr. Hugh Miller, whose geological attainments and powers of description are of acknowledged superiority, says:—"From where Edinburgh now stands, a huge dome of coal measures, greatly loftier than the Pentlands, and that once connected the coal measures of Falkirk with those of Dalkeith, has been swept away by the prolonged roll of the Atlantic." This, then, originally constituted, so to speak, the mighty multiplex envelope, within the folds of which I conceive the several mineral metamorphoses to have been (*in situ*) effected, and which, subsequently denuded thereof, as above stated, were respectively left, *en masse*, in all the ruggedness of outline and feature we now behold them. Thus, from the peculiar character of the phenomena I have described, as successively presented along the range of Salisbury crags and elsewhere, I am induced to conclude that electro-chemical or crystalline forces, acting under variable conditions of temperature, moisture, &c., and on irregular areas of the subterranean and submarine sedimentary (or pre-existing) deposits, have converted them, from mechanical aggregates, into the compact crystalline aggregations which now present themselves to the eye in such strikingly bold and adamantine masses.

Whatever were the circumstances attending the transmutation, whether effected even by eliquation (a separation by fusion), or segregation (a chemical separation), or whether a mere electrical transposition of the crystalline particles, mainly accomplished the present structural arrangement of the components of the greenstone, we have the most palpable evidence to assure us that the intensity of the action was very unequally distributed. In certain localities, the igneous rock exhibits a partial conversion into the aqueous, and *vice versa*. This is peculiarly the case with the second projecting cliff of greenstone, at the northern extremity of the precipices: here, to a height of some 60 feet, the red oxidised and other ingredients of the stratified sandstone are so intimately blended with the components of the trappean rock, that it requires the closest scrutiny to distinguish which of the two formations the cliff belongs to—a difficulty not a little increased by the fact that, from the base to the summit (whereon repose the horizontal sedimentary strata), it is traversed by vertical or polar cleavage lines, imparting a somewhat stratified aspect to the whole pillar of rock. Again, an example occurs a short distance from the south-eastern termination of the range of crags, and close to the Queen's Drive, where a mass of reddish sandstone strata emerges, as it were, from beneath the base of Arthur's Seat. In this instance, one or two of the arenaceous strata are partly converted into the irregular globose concretions common to trap deposits; and so manifest is this partial transmutation, that Nature may be said to be here detected in the very process. Very similar examples occur in Salisbury cliffs, facing the south, and on the south side of Calton Hill. In fact, these and numberless similar illustrations, would seem fully to warrant our designating the pre-existing aqueous formations, with their alumina, oxide of iron, silica, &c., the *raw material* from which the gnomes of the subterranean laboratory have manufactured the substituting trap rocks, abounding in all the above constituent ingredients, but appearing mainly as augite and hornblende. Under perfectly congenial conditions and circumstances, the development was complete, in the character of the hard, compact, crystalline material; but where any deficiency existed in such essentials, the result was the sort of hybrid production to which we have repeatedly adverted. And whether viewed in a vastly extended or a limited sense, the action, or metamorphic principle, has alike been extremely varied and arbitrary—here intense, there weakened; in some places suddenly arrested, or exhibiting—as throughout immense areas of country—no signs of its ever having operated at all. And it is here worthy of observation that, as in the regions where this metamorphic action has prevailed, amorphous trappean masses of all sizes (some composed of concentric layers, like the coats of an onion) are not uncommon in the formations on which it has acted, so may we pretty readily account for the presence of the numerous (erratic) boulders of greenstone scattered throughout such neighbourhoods; the oceanic surges which have torn off the sedimentary, or less indurated, deposits in which they were embedded, have left the massive boulders disposed as we now see them. In perfect accordance with these views, we find not only the shores of the Frith of Forth, &c., strewed with enormous boulders of greenstone, but numbers of them may be observed dotted about the lofty western declivities of Hunter's Valley, and there reposing on the regular aqueous deposits; one of an immense size lies upon these strata, almost on the very verge of the Salisbury precipices, where they terminate to the northward; and there are two or three others of very large dimensions lying on the sandstone quarries a few yards lower down to the south-eastward, the greenstone boulder in the nearest being a pretty good specimen of the hybrid production, as above pointed out. This may be a novel mode of accounting for the appearance of the numberless huge trappean boulders we find in all sorts of anomalous, puzzling situations throughout the region in question, but assuredly it has more of the *ratio justificu* to recommend it than can be attributed to the sometimes singularly partial or local distributions, said to have been effected by the boulder-freighted, floating iceberg.

From the whole of the local disquisitions now entered into, I am led to conclude that, in all probability, whilst the uppermost carboniferous strata were concealed by the unfathomable depths of ocean, and ages of ages ere the briny wave dashed against the rugged heights of Arthur's Seat, its imaginary lion couchant received, by inherent crystalline action, his general form, as also the other of the so-called igneous protuberances, and often extensive ranges, and which, ever since denuded of their stratified envelope by the oceanic currents, have constituted no inconsiderable portion of the most fantastic and picturesque scenery of the globe.

However startling the views here advanced, respecting the formation of trappean rocks, may appear to the advocates of the igneous theory, I would remind them that they differ in no essential particular from the received doctrine of metamorphic rocks, save in their extreme thermometrical notions, as opposed to the chemico-crystalline theory here mainly contended for; and whilst such views can lay claim to at least an equal support from evidence, the most palpable, are certainly immeasurably more in consonance with those silent, inappreciable operations of creative energy, by means of which are elaborated the most astonishing, and often tremendous results, but which sublime order of progression the Plutonic system so far violates as to pretty profusely bespatter the surface of the earth with huge masses and mountain ranges of the incandescent products of volcanic throes, vomiting forth their fiery floods through untold ages, even down to the most recent geological epochs, when the higher orders of vegetable and animal existences adorned and gladdened the fair face of Nature.

[*To be concluded in next week's Mining Journal.*]

TIN-FOILS OR SHEETS.—Mr. R. A. Brooman, the patent agent, of Fleet-street (for a client), has patented an invention, which consists of an improvement in manufacturing tin-foils or sheets; by means of which a material reduction of the cost thereof is effected, while those qualities which are essential to the purposes for which such foil or metal is required are retained. This is effected by combining the baser and cheaper metal, lead, with the tin; not, however, in the form of an alloy or mixture, but in such manner that each metal will be kept perfectly distinct,—the tin or superior metal only being exposed, while the lead or inferior metal is encased within it. In order to manufacture such sheets or foils, a peculiar ingot or slab must be first made, by which the whole amount of metals to be contained in the intended sheet or foil shall be joined at their surfaces, and retained in such position that the subsequent action of the rolls may not be able to displace or extend one metal more rapidly than the other; for it is evident that the lead, by reason of its being the softer and more yielding metal, would be squeezed out in an undue proportion to the tin, were it not confined on all sides by the tin. The ingot or slab for rolling is, therefore, formed in the following manner:—Frst, a metallic mould is made, which determines the side of the slab to be cast,—the cavity in such mould may be, say, 6 in. wide, 1 in. thick, and 10 in. long; a slab of lead is then prepared, as much less in size than the cavity in the mould as is designed for the different proportions of the metals, say, of the following dimensions,—5½ in. wide, 9⅛ in. long, and ⅛ in. thick; this when suspended in the centre of the mould, will leave a clear space all round, and the tin can then be poured in. To accomplish the suspension of the lead slab properly in the mould, small blocks or posts of tin are prepared, of a length equal to the space left between the lead and the sides of the mould; and, by placing these around on all sides, the slab of lead is sustained exactly in the centre. The surface of the lead being perfectly clean, or properly fluxed or coated with an alloy of lead and tin, the mould is ready to receive the tin, which is poured in until the whole of the space is filled—the lead being then completely encased within it; the posts of tin, of course, combine with the fluid tin poured in, and form part of the solid mass. The slab is now ready for the rolls, and may be extended into sheets and foils of any degree of thinness. From this formation of the slab or ingot, it is evident that the lead cannot escape from the tin, but must extend and be pressed out with it in exactly the same manner and at the same rate, thus insuring perfect equality in regard to the given proportions first adopted as to every part of the sheet,—no one part having more lead in combination with it than another. The patentee claims the manufacture of foils or sheets composed of tin and lead in separate strata combined, so that the exposed or external surface shall be pure tin only, by the means and in the manner hereinbefore described.

ON THE MANUFACTURE OF STEEL, AS CARRIED ON IN THIS AND OTHER COUNTRIES.—No. V.

BY CHARLES SANDERSON.

I have endeavoured in the foregoing to give a clear, at the same time a condensed description of the raw material required, and the process used, in the manufacture of each kind of steel found in commerce, either in England, the Continent of Europe, or America, which concludes the first part of this essay.

In contrasting the steel manufacture of England with that of America and the Continent of Europe, I propose first to form an estimate of the weight of steel manufactured in each country, and its value as an article of commerce; secondly, to show that England produces a greater weight of steel than the whole of the Continent of Europe and America; and also, by a comparison of the degree of perfection attained in each country, prove that whilst England produces a greater weight of steel, she also eminently excels other countries in her knowledge of this branch of manufacture.

From these two heads I shall show the importance of this branch of our industrial commerce as a source of wealth to the nation, and contrast the high superiority of the various steels made in England with those produced in other countries, proving not only that the annual value is of importance to us as a manufacturing community, but that our scientific knowledge and practical skill have placed us very greatly in advance of other nations in the production of steel.

The following table shows the production of steel in France:—

Year.	Raw steel.	Converted steel.	Total produce.
1826	Tons 3,257	1,500	4,757
1835	2,949	3,308	6,257
1840	3,546	3,859	7,405
1841	3,202	3,684	6,886
1842	3,527	5,812	9,339
1844	3,212	7,782	10,994
1845	4,004	8,369	12,373
1846	4,408	8,546	12,954

The manufacture of steel in France is considerable. They produce natural steel from the white iron of Dauphiny, and the metal produced from the spathose ores, which latter they import. The manufacture of converted and cast-steel has, during the past ten years, become important. The principal works are situated at St. Etienne, at which Swedish iron is mostly used, as at Sheffield. Although the French produce a considerable weight of cast-steel, yet its quality is by no means equal to that produced in England, since English cast-steel is now largely imported, particularly for best purposes.

Of the above, it must be noticed that the raw material is not the manufacture of the country, but a large portion is imported from Sweden; yet the table shows the weight of steel produced annually in this country. In 1846, the produce is estimated at 12,954 tons, of which 4408 was raw or natural steel, and 8546 converted steel.

There is no return of refined steel; but, as it is manufactured from the raw steel, it does not affect the statistical account. Cast-steel being only made by two or three houses in France, the weight is not to be exactly obtained. The raw steel is higher in France than other countries, as it is protected by the import duties. I estimate it at 25*l.* per ton. The weight of cast-steel I estimate in round numbers at 2000 tons, which I value at 60*l.* per ton, on account also of the protective duty. The iron for this production is imported.

The value of the steel product in France is—

12,954 tons natural and converted steel, at 25*l.* per ton	£323,850 0 0
2,000 tons cast-steel, at 60*l.* per ton	120,000 0 0
14,954 tons.	£443,850 0 0

In the Prussian dominions the major part of the steel produced is manufactured in Westphalia, around Remscheid, Lohngen, and Hagen. A portion is made in Silesia, Thuringia, and the Brandenburg district, in which there exist several converting furnaces.

The produce of the kingdom is as follows:—

Year.	Raw steel.	Refined steel.	Cast-steel.
1837	103,038	42,472	682
1838	101,820	60,308	818
1839	100,526	56,309	727
1840	97,980	68,602	636
1841	100,697	69,496	909
1842	95,926	61,483	909
1843	107,730	60,794	909
1844	100,642	68,391	1,500
1845	109,427	70,480	1,750
1846	81,966	47,449	1,223
1847	112,672	54,309	4,357
1848	105,276	51,644	5,069
1849	88,040	53,661	11,121
1850	107,674	68,379	17,645

These weights are in Prussian zentners.

In this Table the converted steel is included in the weight of raw steel, from which material both the refined and cast-steel is produced. The number of furnaces employed to produce this steel are—143 charcoal fires, or refineries for raw steel; 105 furnaces for refining raw steel; 7 converting furnaces; 58 melting holes, or furnaces. In 1850 the Brandenburg district produced 3160 zentners of converted steel.

Silesia produced	1,630 zentners	raw steel.
Sax Thuringia	4,918 ,,	ditto
Westphalia	41,261 ,,	ditto
ditto	57,220 ,,	refined steel.
ditto	17,336 ,,	cast-steel.
Rhenish Prussia	56,605 ,,	raw steel.
ditto	11,159 ,,	refined steel.
ditto	309 ,,	cast-steel.

The refined steel is largely used in the manufactures of the country; a further quantity is exported to the United States of America, to France, and Spain. The raw steel is used for common purposes. The cast-steel is principally made into railway springs and axles. The refined steel is of course manufactured from the raw steel.

In estimating the value of the whole produce, I deduct the waste of metal which arises from the refining process so as to obtain the nett remainder of raw steel; this waste I estimate at 15 per cent. upon the weight, produced in 1850, 68,379 cwts.; this will consume 78,634 cwts. Also, cast-steel is made both from raw steel and also converted.

Of the 17,645 cwts. manufactured, I estimate 10,000 cwts. as produced from raw steel, and 7645 from converted steel. 88,634 cwts. of raw steel is, therefore consumed in the manufacture of refined steel and cast-steel, leaving 19,040 cwts. for common uses, or exportation.

I estimate the whole of these products as follows:—

68,379 cwts. or 3419 tons refined steel, at $100 per 1000 lbs. Prussian, or 30*l.*	£112,570
17,645 cwts. or 882 tons of cast steel, at 45*l.* per ton	39,690
19,040 cwts. or 952 tons of raw steel, at $56 per 1000 lbs. Prussian, or 16*l.* 16*s.*	18,564
5253 tons. Amount	£170,824

The weight of pig-iron consumed in Austria in 1848 was 368,000 cwts., equal to about 10 per cent. of the whole product of the blast furnaces of that country, including Hungary. This metal produced 287,300 cwts. of raw steel, of which 80,000 to 90,000 cwts., or 4500 tons, were consumed in the country in the form of steel, more or less refined, for the manufacture of sythes, files, and tools, besides the raw and common steel used for agricultural implements and the like.

The exportation in five years, from 1843 to 1847, was equal to 87,120 cwts., or 4356 tons, shipped from Tricste to the Levant, Mexico, and South America.

The product of converted steel in 1848 was 125 tons; the product of cast-steel in 1848 was 210 tons, obtained chiefly from the melting of raw steel.

From the above statement the product of refined steel is 8856 tons, and 15 per cent. for waste in producing it from raw steel; and I find it requires 10,184 tons to produce it, leaving 4181 tons of raw steel for common purposes, named above.

I estimate the whole produce of Austria as follows:—

4,500 tons refined steel, for manufacturing in the country, at 30*l.* per ton	£135,000
4,356 tons steel exported, all sizes, averaged at 24*l.* per ton	104,544
4,181 tons raw steel, used for common purposes, at 19*l.* 10*s.* per ton	81,578
13,037 tons. Amount	£321,078

Sweden produces both keg and steel in faggots, which is chiefly shipped

to the East Indies. The demand is very variable for this steel, and whilst at one time a considerable quantity is produced if the demand is brisk, at another their forges produce iron, which they can at all times either sell or send to the general depot at Stockholm.

Denmark, Holland, Spain, Portugal, Sardinia, and Italy, produces no steel of importance.

In the United States of America raw or natural steel is not produced; the only kind at present manufactured is converted steel, produced from the Russian and Swedish irons, so largely imported by them. In a country which is advancing so rapidly it is impossible to form any distinct estimate of the weight manufactured, but from my personal knowledge of the extent of it I consider that 10,000 tons is a large estimate. Several attempts have been made to produce cast-steel in New Jersey and Pittsburgh, but hitherto without success.

The American blister steel is quoted at 5 cents per lb., or $102 per ton, at 8 per cent. exchange is equal to about 21*l.* 5*s.* per ton; on 10,000 tons this would represent a value of 212,500*l.*

The manufacture of steel in England is chiefly confined to Sheffield, although it is also made at Newcastle and Staffordshire. I have already shown, in the early part of this essay, that the importation of Swedish iron, combined with that furnished from English materials, amounts to from 40,000 to 50,000 tons per annum; of course this weight represents the quantity of steel manufactured of every description.

Mr. Scrivenor estimates the number of furnaces in Sheffield and its neighbourhood as follows:—

Year.	Converting Furnaces.	Cast-steel Furnaces or Holes.
1835	56	554
1842	97	774
1846	105	974
1853	160	1495

Now, a converting furnace will produce 300 tons of steel per annum, but if I estimate each to produce 250 tons, 160 converting furnaces would represent a make of 40,000 tons of steel a year in Sheffield alone. Again, he says there are 1495 melting holes, each furnace of 16 holes will melt 200 tons; this shows a product annually of 29,900 tons, but as such furnaces may not all be in continual work, from various causes, I have estimated the quantity of cast-steel manufactured in Sheffield at 23,000 tons. The weight of coach-spring steel I have estimated at 10,000 tons, leaving a remainder of 7000 tons of bar for the manufacture of German faggot, single and double shear-steel. As regards the price, I take cast-steel at 45*l.* per ton; its commercial varies from 35*l.* to 60*l.* per ton nett, and as a large quantity of the cheaper steel is sold, I have fixed 45*l.* per ton on an average. The price of bar steel is below the real value, since it includes all shear steel, the best of which sells at 60*l.* per ton, whilst, however, a portion of this 7000 tons sells only at 28*l.*, and some even lower. The price of coach springs is the price now paid for them.

I estimate the weight and value of the steel made in England as follows:—

23,000 tons of cast-steel, all qualities, at 45*l.* per ton	£1,035,000	0	0
7,000 tons bar steel, including German faggot, single and double shear steel, average 35*l.* per ton	245,000	0	0
10,000 tons coach spring steel, 19*l.* per ton	190,000	0	0
40,000 tons.	£1,470,000	0	0

From the foregoing statistics, we find that—

France	produces	14,954 tons,	average value of	.....	£ 443,850	0	0
Prussia	,,	5,453	,,	,,	170,824	0	0
Austria	,,	13,037	,,	,,	321,079	0	0
United States	,,	10,000	,,	,,	212,500	0	0
England	,,	40,000	,,	,,	1,470,000	0	0

Such is the contrast of the manufacturing power of the steel-producing countries; it shows the eminent position of England, both in weight and value; this can only arise from the practical skill and scientific knowledge which we have brought to bear upon its manufacture; and the active energy which has enabled us to produce steel suitable for every purpose in the arts; the superiority not only enables our manufacturers to maintain the high position they now hold, but to increase it yet further; for we daily see our production of that expanding, not only to supply the wants of our home manufactures, but also for the Continent of Europe, as well as the United States of America and Canada.

In conclusion, I may add, that whilst it is a business which affords a fair manufacturing profit to those who have embarked in it, it also adds very largely to the wealth of the empire. The working-classes also enjoy its benefits; independent of the well-paid labour required to produce steel to the value of 1,500,000*l.* sterling, it gives occupation to the collier by causing a consumption of 120,000 tons of coals annually.

A LIST OF THE DUTIES IMPOSED BY VARIOUS COUNTRIES UPON STEEL.

THE ZOLLVEREIN	1 dollar 15 silver groschen per cwt.
AUSTRIA	4 florins per Vienna centner.
BELGIUM	80 centimes per 100 kilogrammes, about 2 cwts.
FRANCE	18*l.* 4*s.* per ton on bars, 32*l.* per ton on sheets.
SWEDEN	Cast-steel, 6 rix-dollars; refined steel, 15 rix-dollars; raw and converted steel, prohibited.
RUSSIA	75 copecks per pood = 36 lbs. English.
HOLLAND	20 kreutzers per Dutch centner.
UNITED STATES OF AMERICA	15 per cent. *ad valorem* on cast, shear, German, &c., in bars; 20 per cent. on sheet and blistered steel.

EXTENT OF COAL IN ENGLAND.

At the Geological Society, Mr. R. Godwin-Austen, F.G.S., read a paper "On the Probable Extension of the Coal Measures beneath the South-Eastern parts of England." From the valley of the Ruhr to that of the Scheldt, near Valenciennes, there extends for 170 miles from east to west a continuous series of productive coal measures, which are placed on the north edge of a mass or ridge of older formations, the principal part of which is known as the Ardennes. From Valenciennes the coal beds, covered up by later formations, trend to the north-west, by Douay, Bethune, and St. Omer, to Calais, beneath which last-named place coal has been met with in boring for water. Along the Ruhr the coal measures have a visible breadth of at least 16 miles, and extend far away beneath the cretaceous deposits of Westphalia. From Aix-la-Chapelle to Namur they contract in width, owing to a series of folds which they have undergone from pressure between the ancient ridge and an isolated tract of palæozoic rocks in Central Belgium to the north, which the author described in detail. From Mons westward they expand again—an important consideration with regard to the speculations in this paper. The author observed, that these speculations mainly rested on the correct restoration of the boundaries of land and water areas in palæozoic times; and remarked that among the earliest rocks, as evidences of former terrestrial conditions, it was not until we ascended as high as the upper palæozoic deposits that we met with evidences of definite hydrographical areas; and that many terrestrial surfaces of the carboniferous period have remained such ever since. Mr. Godwin-Austen pointed out that in palæozoic times there existed a main north and south ridge, traversing what is now Western Europe, and extending from Scandinavia to North Africa. To the westward of this old range there was another tract, also running north and south, even then bounded to the west by the Atlantic valley, and now traceable in the northern and western portions of the British Isles. From very early times there was an increase of land from this western or Atlantic tract towards the present European area, by the successive elevation of the palæozoic sea beds. This took place along east and west lines, one of which became the axis of an elevation which is distinctly traceable through a long series of geological changes.

In bringing forward the evidences of these palæo-geographical conditions of Western Europe, and in treating more especially of the east and west ridge above alluded to, the author first remarked that he regarded the absence in France of the upper Silurian series as having been caused by an east and west barrier, cutting off communication with the upper Silurian zoological group of Shropshire and Scandinavia, and constituting a division between two hydrographical areas, in the northern of which the true upper Silurian Fauna had its development; and in the other, what the author regards as its southern equivalent—namely, the Rhenane and Devonian group; and he showed that there was evidence of this barrier in the shingle beds of the lower Silurian, both in northern France and in Cornwall, which point to a neighbouring east and west coast line; in the half-rock of cleavage of the chlorite schists of the Prawle, proving the existence of an elevated east and west range of old rocks, now locally denuded, and replaced by the English Channel; and in the occurrence of an elevatory axis ranging east and west along the southern shores of Devonshire, which has been proved from independent reasonings.

In the unconformity of the old red sandstone and the culm series of the west of England one with the other, and both with the silurian and older rocks, the author observes relations which always exist towards the original limits of formations, and finds clear indications of a neighbouring old coast line, and of land which has long disappeared. The author refers much of the old red series to a lacustrine origin (as suggested by Dr. Fleming and Dr. Mantell), in connection with the western or Atlantic land area. It indicates an abundant vegetation on a considerable extent of land surface of this period, as is also seen in deposits of rather earlier date in the Boulonnais. The conglomerate character of the old red series appears not to pass the old east and west ridge. The author, however, does not lay much stress on the relations of the old red sandstone, which he is inclined to regard not as a separate formation, but as a, perhaps, contemporaneous equivalent of the Marwood series.

Passing over the disposition of the mountain limestone formation, the author proceeds to consider the relation of the coal beds to this old east and west ridge. He traced this old ridge of crystalline rocks, whether bare or overlaid by secondary and tertiary deposits, from the valley of the Ruhr, by Aix-la-Chapelle, through the Ardennes and the south of Belgium, by Liege, Namur, and Valenciennes, and accompanied with the palæozoic formations lying on its northern flank; the contour of the old coast line being more or less clearly evidenced by the lithological conditions of the conglomerates, grits, and sandstones, &c., of the littoral, or deep sea, deposits.

The existence of this ridge to the westward is proved by the chalk axis of elevation through Artois (passing to the north-west at a considerable angle to the eastern part of the ridge), and by the denudation of the Boulonnais, and of the Weald of Kent and Sussex. Whilst further to the west, at Frome, in Somerset, the identical series exposed in the Boulonnais emerges again, in similar unconformable relations; and Devon and Cornwall, as already stated, supply evidence of the western extremity of this old ridge, which united the two great north and south ranges of land, and formed an extensive gulf-like configuration of this western European area in palæozoic times. It was along the inner (southern and western) borders of this somewhat semicircular indentation (open, apparently, to the north) that the great coal formation had its origin. In other words, the Rhenish and Belgian coal beds, together with the midland and northern coal measures of England, are the remains of a succession of fringing bands of dense vegetation, occupying a continuous tract of coast line; and hence the range and extent of a vast littoral band of swamps and forests become apparent. The carboniferous land must have had some considerable vertical elevations, and a vast expanse of continuous horizontal surface, at very slight elevations above the sea-level. The coal, for by far the most part, is the product of a vegetation which grew on the spot on which it is now found. At the era in question, the central gneissic plateau of France was a terrestrial area, with lakes and rivers, and supporting a rich coal vegetation, the remains of which are preserved in the original depressions in which they were accumulated. This old land surface was connected with another in the Spanish Peninsula. Towards the Vosges, also, there was an extension of land, and there we find two distinct levels of coal-growth surfaces. The Vosges, the Schwartzwald, and the Odenwald then constituted a continuous tract, and the Saarbruck coal, with its numerous reptiles, was formed under lacustrine conditions. Crossing the Hundsruck and the Ardennes, we find the great Belgian coal field to present very different conditions. It takes its part in the sequence of palæozoic rocks, and is formed of a series of marine sedimentary strata, alternating almost indefinitely with terrestrial surfaces. With regard to the Boulonnais coal series, the author referred to his former communication on the subject, which shows that it belongs to the mountain limestone series, below the geological horizon of the Franco-Belgian coal. This latter or true coal measure series is not presented in the Boulonnais denudation (which represents a part of the old east and west ridge), but probably underlies the oolitic rocks in the neighbourhood of the Marquise district.

The author then proceeded to point out the relations of the overlying strata to the old palæozoic east and west ridge, and its accompanying coal measures; and he showed that the oolites were evidently affected by the presence of the ridge; and so also were the cretaceous deposits, especially the lower greensand, which puts on decided littoral characters in the south-east of England.

From the foregoing considerations, the author deduced the following inferences:—1. That the physical configuration of western Europe, at the period of the upper or true coal measure period, indicates the probable continuity of a band of littoral coal growths from the midland and south-west parts of England to the south of Belgium.—2. That there may also exist a lower stage of coal deposits, extending somewhat west of the Boulonnais, and of equal value.—3. That the influence of the old axis of flexure on the distribution of the oolitic and cretaceous groups favours the presumption that there are no very thick series of overlying strata interposed between the coal measure series and the present surface.—4. That the upper coal measures may be regarded as occupying a line on the north of the Weald denudation, or conforming generally to the direction of the valley of the Thames; whilst the lower series may occur on a line coincident with the chalk escarpment of that denudation.

RIGHTS OF MINING PROPERTY—THE TORBANE HILL MINERAL.

The readers of this Journal cannot be strangers to the former extraordinary litigation, in the Scottish Courts, respecting the singular mineral substance now so generally known as the TORBANE HILL MINERAL. The case was peculiarly remarkable for the conflict of opinion, not only between the most eminent scientific witnesses as to the distinctive characteristics of the mineral, but also amongst men most eminent for practical knowledge, on the simple question whether the substance was or was not a coal. Its extraordinary gas-producing qualities were acknowledged on all sides; but while many considered, and confidently asserted, that the mineral was a coal of a peculiar nature, an equal number at least were quite as decided in their opinion that it was merely a bituminous shale. That view is the one now generally received, and it has been confirmed by the admission of the Torbane mineral, for the purposes of gas manufacture into the German states, free from the import duty with which it would be clearly chargeable were it a coal. The former case was, however, decided on grounds wholly irrespective of its chemical or economic qualities, the jury having by their verdict found, and the Courts having approved of that verdict, that no matter what may be its peculiar character, it was the substance respecting which the parties treated, and which had been demised by the lease under the generic term "*coal*." The subject matter of that litigation was, therefore, set at rest altogether, without reference to the question which gave rise to such unprecedented differences of opinion on the part of witnesses of the highest character and repute. The litigation between the landlord and his tenants respecting this highly valuable mineral property has, however, been revived in a different form, but, up to the present time, with the same result as the former suit. The case is a highly important one; and, as the judgment involves important principles in respect of the relations of landlord and tenant, as to the respective rights which they possess or may acquire in mineral property, we direct particular attention to the subject.

The present suit, in which Mr. GILLESPIE, of Torbane Hill, the lessor, was the pursuer or plaintiff, was instituted against Messrs. RUSSELL and SON, of Falkirk, coalmasters, to have the lease set aside. The lease demised to RUSSELL and SON the Torbane mineral, and gave them full powers of working coal and all other minerals on the lands of Torbane Hill, the estate of Mr. GILLESPIE, who now impeached the lease, on the ground that it had been obtained from him and his wife by fraud, concealment, and misrepresentation. In answer to this suit, Mr. RUSSELL and his son pleaded that the right was concluded by the judgment in the former action, in which they alleged that the same question, now attempted to be raised, has been substantially decided. They also insisted that the present claimants ought in the former suit to have put forward all their case, and relied upon all the grounds on which they now alleged that the defendants were not entitled to the mineral in question. They further objected to the form of the present proceeding, and insisted that the case put forward on the part of Mr. GILLESPIE contained no allegations which amounted to fraud on the part of the defendants.

The case was fully discussed before the Lord Ordinary, Lord ARDMILLAN; and it was stated, on the part of the plaintiff, as evidence of the value of the property demised, that there were at least 1,087,279 tons of the mineral to be worked, before the supply could be exhausted, and that Messrs. RUSSELL had, up to the 30th of November last, raised upwards of 76,000 tons, and sold it at an average price of 20*s.* per ton. It was also stated that a ton of the mineral yields at least 26 gallons of paraffine oil, which will bring 6*l.* 10*s.* per ton. It was argued that the previous action was wholly distinct and different from the present, both in its grounds and in its conclusions. It did not proceed, as the present did, on an allegation of fraud in procuring the lease; it merely sought to have it declared that the mineral substance in question was not within the description of the minerals comprised in the lease, and let to the defendants, and was not, consequently, included in that lease. The verdict and judgment in that case merely determined that the lease of the coal, &c., in the lands of Torbane Hill, did comprehend this gas coal, or gas-producing mineral substance. The present suit was framed with a different object, assumed a different shape, and was based on the allegation that the lease of the minerals, and especially of the mineral producing this gas, had been procured by fraud. It was, therefore, contended, on the part of the lessees, that, so far as the present record, the judgment in the previous case was *res non judicata*, and that, as the fraudulent procuring of the lease could not have been alleged in an action brought to obtain a declaration that the mineral had not been demised, the grounds now relied on could not be considered as omitted in the former suit.

In support of the allegation of a fraudulent misrepresentation, a letter of the defendants, of the 27th of March, 1850, was relied on, which described the Torbane gas coal or mineral, as "a coarse parrot or gas coal, which was sunk to by a former mineral tenant, and relinquished." The defendants further proposed 6d. per ton of 22½ cwts. on all coal as "an equalising duty," when it now appeared that the defendants knew at the time the neighbouring Bog Head gas coal had brought, very shortly before, a price as high as 16*s.* per ton of 20 cwts. The defendants answered the imputations of fraud by showing that it was not even now alleged that the statement, that a coarse parrot coal had been sunk to and relinquished, was untrue; and that the proposal of 6d. as an equalising rate of royalty was agreed to by both parties, after Mr. GILLESPIE had consulted with Mr. GEDDES, the mining engineer. It was further insisted, on the part of the defendants, that, in order to vitiate a contract on the ground of fraud, facts must be alleged, which, if proved, would amount to fraud—fraud in the inception of the contract, going to its very root; that general allegations of fraud, as put forward in this case, would not answer; but that it must be alleged and shown that there were either fraudulent misrepresentations of material facts, or fraudulent concealment of material facts, which it was the defendants' duty to disclose, and which were not within the means of knowledge of the party conceiving himself aggrieved. The allegations of fraud in the present case did not fall within this rule, the plaintiff having had more easy and complete opportunities of acquiring the fullest information on every point relating to the property than the defendants; it was insisted, therefore, that he could not now be permitted to complain of his own omission and neglect.

The Court, in delivering judgment, on Tuesday, the 10th of July, observed that the averments of the plaintiff were not sufficient to support the suit, nor were the facts averred sufficient to sustain the general allegation of fraud. The object of the contract or lease was at the time undiscovered, the transaction necessarily a speculation, but the field of discovery was the plaintiff's own property. The lessor did not require to rely, and did not, in fact, rely on the lessees for information in regard to the existence of the minerals on the Torbane Hill, nor as to their nature, nor as to the presence of the particular mineral in question. He had full means and opportunities of investigating those matters for himself. A similar coal had, no doubt, been found and worked, by the defendants, on the adjoining lands of Bog Head, and had been sold by them at a high price; but this fact was within the reach of the plaintiff's enquiry, and it was not a fact which the defendants were necessarily bound to disclose. That the defendants, having worked the Bog Head gas coal, and ascertained its great value, did expect to find it on the Torbane Hill, and, if it were found there, to make a great profit of it, was true; and it may be also true that, if the plaintiff had known to a certainty that valuable gas coal was upon his property, he would not have granted the lease upon the terms agreed on. The presence of the mineral in the lands was not exactly known; and each party, although with more or less confidence, seems to have contemplated the possibility of discovering it. Still, however, the search was a speculation to some extent doubtful, and it was an enterprise requiring capital and involving risk. If the plaintiff had thought fit, he might have rejected the defendants' offer, and have carried on the speculation himself; but he adopted the less adventurous and safer course—he accepted the offer, signed the contract for the lease, and left to the defendants the enterprise, the outlay, and the risk.

The plaintiff was not entitled to expect from the adventurers any explanation of the reasons which induced them to calculate on finding the mineral on his land, or which had led them to enter into the speculation. There was no duty of disclosure in the matter imposed on them; and, consequently, there could not be any fraudulent concealment in that respect. The charge of fraudulent misrepresentation was broadly made; but when the specific and particular facts on which the charge rests are considered with reference to the contract, to procure which the fraud is charged to have been committed, the general and sweeping charge is not sustained by these facts. The landlord, anticipating the probability of gas coal being found in Torbane Hill, proposed a higher royalty or lordship on gas coal; but this was refused by Messrs. RUSSELL, and thus both parties were at free liberty to act. It then appears that Mr. GILLESPIE, himself a very intelligent man, had the assistance of his agent, Mr. MOORE, and of his mining engineer, Mr. GEDDES; he was, therefore, well advised. The matter was not hastily adjusted, and the minute of the lease, when signed, embodied the deliberate contract of the parties. As to the effects of the defendants' letter and proposal of a royalty, it did not appear that any statements made were untrue; and whether true or false, they related to facts in regard to which the plaintiff had better means of knowledge than the defendants. The nature of the coal, the extent of the former working, and the reason of relinquishing, were matters ascertainable by the proprietor; and the adventurers had no knowledge, with respect to the character of the coal, but what was equally within the reach of the landlord. If the coal which had been previously sunk to was not the valuable mineral now in question, the defendants did not know that the mineral existed in the lands, and could only rest their expectation of finding it in inference and skilful calculation from the Bog Head workings, which were legitimate grounds of speculation, but furnished no certainty. If, on the other hand, the coal thus sunk to by a previous tenant was the same valuable mineral, then the presence of it in the proprietor's land was known, or might have been known, to himself, or his mining engineer. In either case, there was not on this point any fraudulent representation.

The proposal of 6d. as an equalising rate of royalty or lordship appears to have been agreed on by the plaintiff and his agent, after consultation with Mr. GEDDES, the mining engineer. The price of all kinds of coal in the neighbourhood, and particularly of the Bog Head gas coal, might easily have been ascertained by Mr. GILLESPIE and his advisers, and Mr. MOORE expressly states "that the defenders' explanation regarding the price of common coal at Bathgate satisfied the pursuer." The explanation respecting the price of common coal is not alleged to have been false and fraudulent, or even to have been incorrect; yet it was upon that explanation, and not on any suggestions as to the price of gas coal, that the plaintiff's agent was satisfied; and the minute of the lease was signed on the footing of the correspondence.

On the whole, the Lord Ordinary was of opinion that there had not been any fraudulent concealment of what the Messrs. RUSSELL were bound to disclose, and that, neither in the correspondence which formed the basis of the contract on which the lease was signed, nor on any personal communication before the completion of the contract, was such fraudulent misrepresentation of facts averred or proved as would entitle Mr. GILLESPIE to sustain the suit. An intimation was at once given of the intention to appeal to the full Court.

NEW PREPARATION OF FUEL.—Mr. A. Dawson, of Barnes-place, Mile End-road, has secured a patent for converting small coal or coke dust, or small coal or coke, into solid blocks of fuel. The inventor thus describes his invention:—"I take small coal or coal dust, or a mixture of coals and coke, and admix a portion of water with the coal, or coals and coke, The coal and water, or admixture of coals, coke, and water, are placed in an iron mould, made air tight or nearly so. This mould is placed in a chamber or furnace, heated to a temperature of from 300° to 700° of Fahrenheit's therometer, for a time—the time and temperature varying according to the quality of the fuel under operation; while submitted to this operation, the desired consistency having taken place, the requisite temperature for which the operator will ascertain, and cause to be indicated by a pyrometer or thermometer, when the mould is then submitted to a pressure, and the block of fuel is removed from the same fit for use. Therefore, what I claim as my invention is, the admixture of coal and water, or coals, coke, and water, and confining the same in iron moulds that are air-tight or nearly so, and exposing the same to heat and pressure, whereby the water unites with the coal, or coal and coke, which compound, when in a softened state, is submitted to a pressure, and becomes a compact mass of fuel."

GREAT DOWGAS UNITED MINE.

PARISH OF ST. STEPHEN'S, COUNTY OF CORNWALL.
In 6000 shares.—On the "COST-BOOK PRINCIPLE."
COPPER, TIN, NICKEL, AND COBALT MINE.
OFFICES,—55, OLD BROAD-STREET.

DIRECTORS.

BENJAMIN SYDDAL, Esq., silk manufacturer, Manchester. 131
JOHN HODGE, Esq., iron founder, St. Austell, Cornwall.
MARTIN KENWORTHY, Esq., Old Broad-street, London.
ALBERT PELLY, Esq., Great Winchester-street, London.

This mine is situated in the immediate neighbourhood of the Great Hewas and St. Austell Consols. It has been worked upon very extensively as deep as the adit (which is 48 fms. from surface). A shaft has been sunk below the adit 18 fms., but nothing has been done there, not even the lodes cut, in consequence of the small water-wheel, which was erected with a length of flat-rods, being found totally inadequate to keep the water, no steam power having ever been employed upon the mine. The accompanying reports of disinterested and experienced mining captains (not written for or addressed to the present lessees) will give some idea of the size and productiveness of the lodes, although only seen in the adit level. In the Great Goffan lode, the heat is so great, and the water issuing from it so warm, that it is painful to remain any time in it, a sure indication of an immense deposit of copper ore. Many hundreds of tons of copper ore, and large returns of tin have been made, and it only requires the erection of suitable machinery for stamping and pumping to enable the adventurers at once to enter into large profits. Independently of tin and copper, it is right that attention should be called to a recent valuable discovery made in the mine of a lode of nickel and cobalt. The St. Austell Consols (the adjoining mine, using the same adit) is now raising upon a parallel lode 10 tons of nickel and cobalt per month, which they readily sell at £60 per ton, or £600 per month; and in that mine the lode was not found productive until they had reached a level considerably below the adit, whilst in Dowgas Mine it is a rich and productive lode in the adit, from which, in 6 fathoms driving, sales have been made within the last few weeks amounting to about £170. The lode gone down in the bottom of the adit is enlarging, and it is confidently expected that, at a lower level, large returns will be made: and this discovery alone will yield a good profit upon working the mine.

The mine was taken for working about two or three years ago by two gentlemen, who have done all the preliminary work, erecting a large and excellent engine-house; sinking an engine-shaft 48 fms. to the adit level, which is of a large size, timbered and secured, and ready for the pitwork; erecting count-house, captain's house, and all other necessary buildings; and have put a considerable plant on the mine, at a cost of many thousands of pounds. For financial reasons, however, they were unable to erect a steam-engine, and the present lessees have purchased the whole plant, and have erected a powerful steam-engine for pumping, to which has been attached 24 heads of stamps, the whole now at work. There are backs now laid open sufficient to return 8 tons of tin per month, besides the copper, nickel, and cobalt; and as the mine is now sunk 18 fms. below the adit, there is no doubt that, when the water is out, and the lodes seen in that level, there will be large profits made from the mine at once. About 2000 shares remain now to be disposed of, at £2 per share. Applications to be made to J. J. REYNOLDS, Esq., stock and sharebroker, 21, Threadneedle-street, London.

On the 12th June, the agents report as follows:—We are happy to inform you that we have set the engine to work with 12 heads of stamps, and by Saturday shall have 24 heads of stamps at work. We have set three pares of men to stope on the copper lode. Our tin pitches are looking well.

June 16.—We have a pare of men stoping in the bottom of the shallow adit, west of engine-shaft, on the copper lode; it is 3 ft. wide, worth £40 per fathom for tin and copper. We shall be in a position in a short time to set several more pitches. Our tin pitches are looking well; one pitch, at Trevanion's shaft, in the back of the deep adit, is looking very well. The tribute at the present time should be 5s. in £1; this day fortnight we shall set it.

June 23.—We have eight pares of tributers at work upon tin, and we think they are getting fair wages on an average. We have about 40 tons of copper ore now broken.

June 30.—This being our survey-day, we set ten pitches, average tribute 10s. 9d. in £1, and to have £46 per ton for tin. The price of our tin is now about £63 per ton, so that the average tribute will not be more than about 7s., and we think they will get fair wages at that tribute.

July 7.—We have this week set two pares of men to stope on the copper lode in the 8 fm. level; each stope is looking very promising for copper ore. Our pitches in the tin lode are looking much the same as last reported.

July 11.—The tin is turning out from the burning-house much better than expected.

The following are only a few of the reports upon this mine, by some of the most respectable mining captains in Cornwall, who invariably express the highest opinion of the undertaking:—

Tincroft Mines, June 13, 1853.—Below I beg to hand you my report of the Dowgas Mine, which I have inspected, in accordance with your request. The first lode I noticed was the south lode at the surface; it is from 6 to 8 feet wide, and a good looking back, from which I think large quantities of tinstuff may be raised; the lode at present will produce some splendid stones of tin, and the capels are tinny throughout. I consider this lode a good speculation, to drive a cross-cut south from the gossan lode to intersect the same. I should say, looking at the old workings on this lode, there must have been a considerable deal of tin raised. From the present appearances, this lode stands all in whole throughout the mine. Gossan lode I consider one of the largest and strongest lodes I ever saw; it is composed of prian, mundic, tin, and copper. It is not rich at present, but in looking at the nature of the lode, and its composition, I think there is every reason to say that this lode will be productive in depth; I think this lode at present would pay well if you had stamping power on the mine. Middle lode is from 4 to 5 ft. wide, composed of mundic, prian, and spar, with spots of tin and copper. This lode is likely to form a junction with the Goffan lode in depth, where I have no doubt they will prove productive, and which I consider to be a very important object. The great copper lode has been worked on very extensively about the deep adit, and judging from the excavations both east and west of the engine-shaft, and the rich copper that still remains against the walls in different places, great quantities of ores must have been raised by former workers; and I have no doubt, when cleared out, this lode will be found productive. The Woodhead lode is about 40 fms. to the north of the copper lode; the workings made on it are about 3 ft. wide, and opened to a considerable extent; it is said it is worked on as deep as the adit, and has produced large quantities of tin, of good quality.—Nickel and Colbalt: This is a caunter branch from 4 to 6 in. wide, and is rich at the deep adit, from the quantity already broken, although it is only driven on a few fathoms; it must be evident that this branch will add greatly to the value of the mine, and I strongly recommend its being prosecuted with vigour, as it is improving in depth. The engine-shaft is completed in a very satisfactory manner down to the deep adit, and it is now ready for the pitwork. In looking at the extent of this sett, and the great number of lodes of such promising character contained therein, I think it is one of no ordinary promise, and if carried out vigorously, I think it will make a very large profit. In conclusion, I beg to say, when looking at the miner-like manner in which everything has been done, both at surface and underground, I think there is great credit due to the managing agent of the mine. PETER FLOYD.

Wheal Tristrem, April 19, 1854.—Agreeably to your request, I have surveyed Dowgas Mine, and the following is my report and opinion:—1. The great gossan lode will average from 12 to 15 ft. wide, for upwards of 150 fms. in length, is composed of gossan, mundic, tin, and copper, but mundic in abundance. About 30 years ago, I cross-cut this lode at the shallow adit, where it measured 7 fathoms wide of gossan, mundic, and tin. Since that day hundreds of tons have been raised and sent to market. It is an old saying, and has proved to be true, that "mundic rides a good horse;" certainly, it must have been a "good horse." to carry so many tons as have been raised and seen in this lode.—2. A middle lode, 4 to 5 feet wide, producing good work for tin and copper.—3. A south lode, about 7 fm. south of the above, with good stones of tin in it.—4. A caunter copper lode, north of the engine-shaft, 5 to 6 ft. wide, which will intersect the above lodes in a short distance eastward. On this lode there have been hundreds of tons of copper raised and sent to market. About 30 years ago, I helped to raise a great many tons of copper ore from this lode above the adit.—5. A tin lode north of the above caunter, called "Woodhead Lode," about 3 ft. wide, has been very productive for tin.—6. Is a nickel and cobalt branch, which is from 4 to 5 in. wide, and will produce about 6 cwts. of nickel and cobalt per fathom. It is at present, having been recently discovered, only opened on about 6 fathoms in length. I consider this branch a very important feature in the mine, as it can, without doubt, be worked with a great profit. This sett has been taken up and worked for hundreds of years past, and the ancient miners have received great profits therefrom. There is a hard floor of ground just under the deep adit level, common in productive mines in this locality. The shaft should be sunk 50 fathoms below the adit, to give these champion lodes a fair trial. This sett being situated in such beautiful strata of mining grounds, about three-quarters of a mile to the south of the granite, will bear out every practical miner in recommending it. There is a great deal of work done at the surface, and a good engine-shaft sunk to the deep adit level. From what I have seen when working on this mine, and from my inspection of it, I say that there is confident reason to expect that it will be a very large and very rich mine, if well worked. JOHN JENKINS.

South Basset Mine, Redruth, May 10, 1853.—Agreeably with your request, I have inspected Dowgas Mine, in the parish of St. Stephens. In the first place, I surveyed the surface, and saw the backs of five lodes, which have been worked on by former miners, and on the south lode I saw several large rocks of tinstuff, but not much has been done on this lode at the adit level, but I think it is very desirable that the deep adit should be driven to it, and explored on. The gossan or mundic lode is only 10 fms. north of the south lode, which is very large, and containing a great quantity of mundic with tin, and I consider it a kindly lode. These lodes will fall together in depth, and in my opinion will be productive. About 5 fathoms north of the gossan, there is a lode called the middle lode, which is also very large, and has been opened on a great distance at the adit level. This lode does not underlay so much as the lodes before mentioned, and is likely to fall into them in depth, when I expect they will produce a great quantity of valuable metal. About 55 fathoms north is a copper lode, exceedingly large, and falls into the engine-shaft, 22 fathoms under the surface. The said shaft is now 48 fms. under the surface, and about two fms. under the deep adit; the lode being still in the shaft, out being perpendicular, and the lode underlaying north, will soon leave it. This shaft is in a good situation for taking the south lodes in depth, they being all north underliers. I beg to observe, that I was exceedingly well pleased with the appearance of the copper lode, and I believe it will turn out a good one. There is another lode about 45 fathoms north of the engine-shaft, which I could only see at surface, and by the old workings, I have no doubt a great deal of tin has been raised from it, and it is well spoken of by the old miners. On the whole, I consider Dowgas Mine a first-rate speculation; and I have seldom seen so many large and promising lodes so near each other, and that can be so easily commanded by the engine-shaft. W. RICHARDS.

Hayle, May 12, 1855.—I have visited, inspected, and beg to hand you my ideas of Dowgas Mine. It is a property, in a mineral point of view, second to none I have reported upon, at the depth already wrought; and from the general appearance of the lodes, considering the component parts, if this does not turn to the right account when properly wrought, to me it will be a great deceiver. T. RICHARDS.

NOTICE TO RAILWAY AND STEAM-BOAT TRAVELLERS.—ANDERTON'S HOTEL, 162, 164, and 165, FLEET STREET. BREAKFAST, with joint, 1s. 6d. BEDS, 10s. 6d. per week. DINNERS from Twelve to Eight o'clock; joint and vegetable, 1s. 6d.; with soup or fish, 2s. TURTLE SOUP and VENISON DAILY. TABLE D'HOTE at Half-past One and Half-past Five, at Two Shillings each. A night porter in attendance. 132

SISAL CIGARS! SISAL CIGARS! SISAL CIGARS!—At GOODRICH'S CIGAR, TOBACCO, and SNUFF STORES (Established 1780), 416, OXFORD STREET, LONDON (nearly opposite Hanway-street), BOX containing FOURTEEN FINE SISAL CIGARS for ONE SHILLING AND NINEPENCE; post free, 27 stamps. None are genuine unless signed "H. N. GOODRICH." 133

THE BRITISH SLAG COMPANY.

(Provisionally Registered.)
Capital £120,000, in 24,000 shares of £5 each.—£1 Deposit.

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THOMAS WINKWORTH, Esq., Sussex-place, Canonbury.

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WM. McCORMICK, Esq., St. Martin's-lane; and Park-crescent, Regent's-park.
EDWARD S. POWER, Esq., 7, Wilton-place, Belgrave-square.

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Messrs. P. Cazenove and Co., London.
Messrs. Bruce and Symes, Dublin.

OFFICES,—CANNON STREET CHAMBERS, 3, CANNON STREET, LONDON.

In the manufacture of iron from the ore, an amount of refuse is thrown out in the proportion of from one to three tons to each ton of iron metal. In lead and copper this proportion is considerably greater. This refuse, variously termed scoriæ, lava, slag, &c., has hitherto remained not only valueless, but a source of increasing embarrassment to the manufacturer, from its vast accumulations. To utilise this product is the object of the operations of this company.

Dr. W. H. SMITH has succeeded in establishing a method by which this refuse, through a simple and most inexpensive process, may be converted into a material that, in its rough moulded state, serves admirably from its texture and durability for paving, flagging, tiling, and general building purposes, and the surface of which, when polished, resembles the best specimens of variegated marble for its beauty and absence from defect; and is, moreover, capable of artistic design, by the incorporation of colour at will in the substance of the material itself, and, therefore, indistructible. The material can be moulded in any given shape or size, and the cheapness of its cost, compared with that of stone or marble, will render its application for building, household, and ornamental purposes, very general.

This important invention has been patented by Dr. Smith, in Great Britain, whose rights therein have been purchased by this company for a fixed sum, the payment of which entirely depends on the complete success of such further testing as hereinafter referred to.

The great value of this invention may be in some measure computed, when it is considered that there are annually in the United Kingdom six or eight million tons of the iron slag alone thrown aside as a refuse material, the utilisation of a fraction of which only would be sufficient to render the invention a most valuable property.

The practical working of this invention has been tested, with a view to ascertain the necessary capital required for the cost of construction and machinery, and for the cost of production of the material.

The cost of the article in its rough moulded state, as applicable to general building purposes, will, at the place of manufacture, not exceed 10s. per ton, so far as the testing which has taken place will permit the directors to judge; but, before any large outlay is made, they propose erecting limited works at first, which will enable them to say with perfect certainty the exact cost. This estimate, in their judgment, leaves a large margin to cover every possible contingency, and, taking London as a central market, there must be added 15s. per ton for the cost of transport, making 25s. per ton delivered in London.

In its polished state it is estimated that it can be manufactured at the rate of 5d. per square foot of 1½ inch thickness, and 4½d. per foot 1 inch thickness. Polished marble of similar thickness sells on an avage of 5s. per square foot. Supposing that the polished manufactured article was sold at only 1s. 6d. per square foot, and as the ton contains 144 feet of 1 inch thickness, it follows that there would accrue a profit of above £9 per ton. A consideration of these figures may fairly suggest a general average profit of £3 per ton on the rough moulded and the polished article taken together.

The question is simply one of consumption, and with the immense advantages which this article affords in point of economy and universal utility, there is little doubt that in a short time the manufacture of 100 tons daily would far from suffice to supply the demand.

Another branch of profit may fairly be expected from revenue to be derived from royalties at different iron-works throughout the kingdom.

Arrangements can be made with several large ironmasters for the erection, on their premises, of the necessary works, so that within a few months after the constitution of the company the manufacture of the material may be commenced; and the returns will be almost immediate.

Applications for shares to be made to the brokers, or the secretary of the company, in the form annexed:— APPLICATION FOR SHARES. 134

To the Directors of the British Slag Company.

GENTLEMEN,—I request that you will allot to me shares, of £5 each, in the British Slag Company; and I hereby agree to accept such shares, or so many as may be allotted to me, on the terms and conditions of the Deed of Settlement of the company, and to pay the deposit thereon of £1 per share when called on.

Name .....
Reference ..... Profession ....
Date ..... Residence .....

PATENT SAFETY FUSE.—The GREAT EXHIBITION PRIZE MEDAL was AWARDED to the MANUFACTURERS of the ORIGINAL SAFETY FUSE, BICKFORD, SMITH, DAVEY, and PRYOR, who beg to inform Merchants, Mine Agents, Railway Contractors, and all persons engaged in Blasting Operations, that, for the purpose of protecting the public in the use of a genuine article, the PATENT SAFETY FUSE *has now a thread wrought into its centre*, which, being patent right, infallibly *distinguishes it from all imitations*, and ensures the continuity of the gunpowder. 135

This Fuse is protected by a Second Patent, is manufactured by greatly improved machinery, and may be had of any length and size, and adapted to every climate.
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SAFETY FUSE.—Messrs. WILLIAM BRUNTON and CO., PENHALLICK, near REDRUTH, CORNWALL, MANUFACTURERS OF FUSE, of every size and length, as exhibited in the Great Exhibition of 1851, and supplied to the Royal Arsenal at Woolwich, the Arctic Expedition, and every part of the globe.
Messrs. BRUNTON & CO. are at all times PREPARED to EXECUTE UNLIMITED ORDERS for SUPPLYING FUSE direct from their own MANUFACTORY, upon warrant that it will prove equal to, if not better, than any to be procured elsewhere. 136

MERCANTILE, MINING, & AGRICULTURAL LABORATORY,
CONDUCTED BY
W. CROWDER, F.C.S., CONSULTING AND ANALYTICAL CHEMIST, 137
104, SIDE, NEWCASTLE-ON-TYNE.
Late Lecturer on Chemistry in the Newcastle College of Medicine, and formerly Assistant in the Laboratory of the Highland and Agricultural Society.

Mr. W. CROWDER begs to inform such persons as are connected with Mercantile, Mining, or Agricultural pursuits, that he will be happy to perform ANALYSES and ASSAYS of every description, and to be CONSULTED upon subjects pertaining to SCIENTIFIC CHEMISTRY. A limited number of PRIVATE PUPILS are admitted to the laboratory on the following terms:—

Fee for 12 months' course of instruction, in one payment in advance... £20 0 0
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MINING.—PATENT PUMPING AND WINDING STEAM-ENGINES, MADE PORTABLE, AND MOUNTED ON BROAD WAGON WHEELS, TO BE LET ON HIRE, OR FOR SALE.—All interested in mining are invited to INSPECT MEDWIN AND HALL'S PATENT PORTABLE STEAM-ENGINES. (See the Reports of this Journal.) 138

Several of these engines are in stock, and ready for immediate delivery, of 4, 8, 10, 12, 16, 20, 25, and 40-horse power, adapted for mining and other purposes. They possess advantages of strength and simplicity over all other portable engines; and may be seen at Messrs. MEDWIN, HALL, and Co's, sole patentees and manufacturers, 92, Blackfriars-road, London.

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SPECIAL INSTRUCTION in ASSAYING and CHEMISTRY for gentlemen intending to proceed to the colonies. 141

CLAY PURIFICATION OF GAS.—This process is APPROVED and ADOPTED by some of the most intelligent GAS ENGINEERS in the kingdom, and their opinions are fully borne out by the investigations of Dr. Letheby and other scientific authorities. It will, no doubt, be employed in nearly every well managed gas-works; and will lead to an enlarged consumption of gas in private houses, from which it is now excluded by a fear of its impurity.—Terms of license, &c., may be obtained of Messrs. HOLMES BROTHERS, Huddersfield, agents to the patentees. In use at the gas-works of Leeds, Preston, Huddersfield, Wakefield, West Riding County Gaol, &c. 142

TO INVENTORS AND MANUFACTURERS.—The "SCIENTIFIC AMERICAN" is the BEST and CHEAPEST WEEKLY PAPER for MECHANICS and INVENTORS. Each number is illustrated with from Five to Ten Original Engravings of New Mechanical Inventions; also, a List of American Patents; worth ten times the subscription price to every inventor. Terms, 11s. per annum.—Apply to AVERY, BELLFORD, GARDISSAL, and Co., patent agents and negociators, No, 32, Essex-street, Strand, London. Corresponding offices in Paris Brussels, and New York. 143

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IMPROVED PATENT WIRE ROPE.—Mr. ANDREW SMITH, the ORIGINAL INVENTOR of WIRE ROPE, LIGHTNING CONDUCTORS, and SUBMARINE TELEGRAPHS, solicits the attention of the public to his IMPROVED PATENT MANUFACTURE, as the best and cheapest, having obtained his sixth patent since 1835.—Office, 69, Princes-street, Leicester-square, London. 145

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GALVANISED SIGNAL CORDS AND KNOCKER LINES; will not rust or corrode, and not affected by the copper water in mines. Very strong, and not at all liable to break. Prices from 15s. per 100 yards.

PATENT ASPHALTED ROOFING FELTS, 1d. per foot.
DRY HAIR BOILER FELTS, to SAVE COAL.
PATENT BOILER COMPOUND, for bad water. 146
FAIRBANK'S WEIGHING MACHINES, of all sizes.
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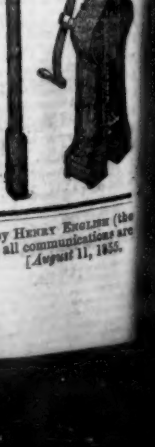

153

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